Claims

1. An impact-induced pulse sensor comprising:

- a housing having a longitudinal axis;

- guiding means arranged on said housing;

- a sensor element adapted to be displaced within said housing along said guiding means when an essentially pulse-shaped impact of a given duration is exerted on said housing, said sensor element being displaced with a predetermined speed (dx/dt) and along a predetermined distance (x), said guiding means being configured such as to affect said speed (dx/dt), said sensor element, further, being made of a magnetic material;

- pickup means rigidly connected to said housing for magnetically generating a measuring signal (U_i; U_M) derived from said displacing of said sensor element caused by said impact;

said sensor element, when displaced, generating in said pickup means a measuring voltage (U_M) depending from said distance (x), said guiding means affecting said speed (dx/dt) such that for impacts with like pulse areas said measuring voltage (U_M) vs said distance (x) is independent from said duration of said pulse-shaped impact.

2. The sensor of claim 1, wherein said sensor element is guided within said housing along an inner wall, a guiding groove being provided on said inner wall, said sensor element being provided with a pin engaging said guiding groove, said guiding groove being inclined relative to said longitudinal axis by an angle (α), said angle (α) varying along said distance (x).

3. The sensor of claim 2, wherein said inner wall is a cylindrical wall and said angle (α) is derived from the following equations:

$$M_{(x)} = 1 + J/(mr^2\tan^2\alpha) \qquad \text{(I)}$$

$$M'/M_{(x)} = S(\phi'/\phi_{(x)}) \qquad \text{(II)}$$

where

α	=	angle of inclination of said guiding groove along said longitudinal axis
r	=	radius of cylindrical inner wall
x	=	distance of said sensor element
m	=	mass of said sensor element
$M_{(x)}$	=	effective mass, normalized on said mass m
M'	=	dM/dx

J = mass moment of inertia of said sensor element

$\phi_{(x)}$ = magnetic flux integral

ϕ' = $d\phi/dx$

S = a first parameter of variation, varied in a range of between 0 and 2

$M_{(0)}$ = a second parameter of variation, varied in a range of between 1 and 10

wherein in above differential equation (II) said parameters of variation (S, $M_{(0)}$) are varied empirically within said ranges, until in a calculation of said displaced sensor element said measuring voltage (U_M) vs distance (x) is independent of said duration of said pulse-shaped impact for impacts with like pulse areas.

4. The sensor of claim 1, wherein said sensor element is a permanent magnet.

5. The sensor of claim 1, wherein said pickup means is an induction coil.

6. The sensor of claim 1, wherein said sensor element is displaced along a trajectory and a return magnet is arranged within said trajectory.

7. The sensor of claim 1, wherein said sensor element, when being in an initial position, is retained by means of a holding element, and gets loose from said holding element only if a predetermined detaching force is exceeded.

8. The sensor of claim 7, wherein said holding element is configured as a soft magnetic plate holding said sensor element in its initial position across a predetermined magnetic air gap with a predetermined retention force.

9. The sensor of claim 1, wherein said sensor element is displaced along a trajectory and a test pickup element is arranged within said trajectory between an initial position of said sensor element and said pickup means.

10. The sensor of claim 1, wherein said test pickup element is a test pickup coil.